



Fibonacci Spirals in Nature

Subject Area

Math, Art

Ages/Grade Level

K-5 can be adapted depending on age of students

Description

Part One - Bring in objects in from nature that contain spirals. The highlighted food is Romanesco Cauliflower (aka 'broccoli'). Bring in the Romanesco to see the whole head and also a cut up head for the students to sample. Bring in a sunflower from school garden or farmer's market (dried is fine if fresh is not available – need to see the seed pattern), nautilus or other shells that have a spiral in them, succulents or other plants that grow in a spiral, pinecones. In addition to the above mentioned items for the students to handle and observe, have a picture or each to put on the overhead and project onto a screen as each item is examined. Briefly discuss what the Fibonacci spiral is and when it was discovered/first observed in nature.

Part Two – Show students how to construct a Fibonacci Spiral on an overhead. (This needs to be made ahead of time using graph paper and tracing paper.) Talk about the 'Golden Rectangle' and show examples of the 'Golden Rectangle' on the walls in the classroom. Discuss how humans naturally gravitate to the golden ratio and rectangle – we see it as beautiful. Using a piece of graph and the Fibonacci sequence, color each square and 'golden rectangle' a different color. Using the tracing paper as an overlay, show how '1+1=2' begins the sequence. An arc connects the corners of the '1x1' squares to start the spiral. With the next transparency overlay, show how the '1x1' squares and the '2x2' squares form a golden rectangle and how an arc connected the vertices of the squares continues the spiral. Continue the overlays until the page is filled. (see pictures)

Part Three – Ask students if they would like to taste a Fibonacci Spiral and do a Five Sense Taste Test of the florets of the Romanesco. Discuss nutrition briefly of broccoli.

Big Ideas (What's the broad overview of your goals?)

Major - Living things grow in a spiral form because it allows them to grow without changing. The cells/pattern repeats and gets larger.

Minor – Humans are hardwired to see certain patterns and ratios and proportions as beautiful. We are part of nature too.

Essential Question

Why do living things grow in a Fibonacci spiral? Why is the Fibonacci sequence found in nature? How does math connect to life?



Learning Objectives (What objectives are specifically taught?)

This exposure lesson touches on math in nature and in our lives. It shows the connection between math and science and art and what we eat.

Keywords Theme (Included for Sorting Purpose)

- Nutrition/Health
- Cooking
- Food and Culture
- Garden/Growing
- Indoor/ Outdoors
- Project/Activity
- Other

Curriculum Standards Connections (Please refer to the broadest Standard or Common Core that applies – at most Three)

Common Core (GLCE Equivalents):

NGSS (GLCE Equivalent):

C3 (GLCE Equivalent):

Prep Time (How long will it take to prepare the lesson? We are aiming for minimal prep time;)

This would work well as a kit. The graph paper could be prepared once and shared. It took me at least 2 hours to print pictures, gather materials and create graph paper and transparencies. This does not count time spent shopping for sunflowers. Cutting up the broccoli for tasting is 10 minutes.

Time (How long will the actual lesson take? 30min – 45min)

Has been done in both 30 min and 45 minutes sessions

Materials (What is needed for the lesson? – Not a lot of money or time to create)

I purchased sunflower at a \$1 a stem and left one in each classroom for students to study. All other materials I had a home.

Advanced Preparation

Background Info (What does the teacher need to know to teach this lesson? 5 - 6 sentences, keep it simple)

Fibonacci sequence, golden ratio, golden rectangle. All info can be found on Wiki. Could print something out for teachers to read ahead of time

Lesson Description:

Framing/Opening/Hook (How do you set the stage for students and get them interested in the topic?)

“Have you ever seen a spiral in nature?”



The Plan/Procedure/Lesson Activities (What steps will the students go through to learn the lesson? Please be specific as you can and number all of the steps required - Instructional writing style)

See above

Wrap up and Reflection (How you bring the lesson to a close and assess your students understanding of what was taught?)

Seasonal Modifications (How can the lesson be changed for relevance in each season? Is there a rain plan/indoor adaption to the lesson?)

Extensions /Games (After teaching this lesson, what can the teacher do afterwards to re-enforce learning? Is there a complimentary extra activity if there is extra time?)

There are several teacher guides on math activities using the Fibonacci sequence. There are also children's books on the mathematician. There is a Discover Channel video for kids.

Credit for Adaption (Did you refer to any websites, curriculum, handouts or books to help develop this lesson?)

Additional Resources

Reproducible Student Pages (Blackline Masters for student worksheets)